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This Sellers' Market

The present *opèra bouffe* conditions in industry are well illustrated by the fact that one is constantly encountering in clubs and restaurants commercial representatives being entertained by the buyers. Again, it is said that one buyer has been known to call on foundries armed with a generous supply of farm produce, which he is prepared to barter for a rapid supply of castings! This state of affairs is distinctly detrimental to sound business as it indicates a sellers' market run wild. This enables the manufacturers, especially for long term contracts, to impose all sorts of escalator clauses to take care of all types of eventualities which may arise between receipt of order, and the despatch of the goods. Unless kept in check this mental attitude can easily lead to uncontrolled inflation. In an industry not related to foundry practice, a group of employers met to consider an increase in prices due to a major wage award. After discussion one member protested that some mistake had been made as the proposed advance would give him a ridiculously high rate of profit. The mistake had been made of attaching to the sale price the percentage accorded to labour, whilst neglecting the fact that wages were only a percentage of costs involved.

The foundry industry can look upon the conditions surrounding this sellers' market with something of a judicial mind, because the industry buys as well as sells many millions of pounds worth of goods per annum. Buying is a more difficult job than selling at the moment, and a wise industrial administration would do well to investigate existing conditions. An endeavour should be made wherever possible—especially on short term buying—of eliminating, or at least reducing to the minimum, all escalator clauses. There is at the moment far too great a temptation to " pass the buck," by the insertion of many types of clauses designed to protect the seller against increases in the costs of labour and materials during the course of carrying out the contract. Obviously it is only right that *unavoidable* costs should be passed on, but the aim should be to ensure that these and these only are included, and not a quota of profits on each item. An examination of the clauses in existing contracts will reveal their diversity and the unknown liabilities which have been assumed. It is necessary to ascertain whether these liabilities are reasonable or unwarranted, and appropriate action should be taken to rectify those too loosely worded. Conversely, it is good business to give firm quotations wherever possible. Conditions of sale have been established by most of the foundry organisations, and these are fair and reasonable, and no reference to these is implied. It is the covering letters and conditions as to price escalation that we have in mind.

There is, however, one section of the foundry industry which has to pay the greatest attention to its buying policy. Unlike the rest of the industry the steelfounder has his selling prices controlled for him. As castings are competitive this position needs rectification.

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GERMAN TECHNICAL REPORTS

Further reports submitted by teams of industrial experts, which have visited Germany for the collection of scientific and technical intelligence from German industry, are now available for publication. A limited number of copies will be on public sale and may be irdered from the Sales Offices of H.M. Stationery Office, York House, Kingsway, London, W.C.2; 13a, Castle Street, Edinburgh, 2; 39-41, King Street, Manchester, 2; 1, St. Andrews Crescent, Cardiff; and 80, Chichester Street, Belfast, at the post-free price (given in brackets) after each report in the list given below.

C.I.O.S. XXXI—20. Refining of cobalt, nickel, zinc and cadmium (2s. 8d.). B.I.O.S. 8. Manufacture and application of specialised magnetic materials generally (8s. 9d.). F.I.A.T. 485. Ferro-alloy manufacture and use (1s. 7d.). B.I.O.S. 296. German non-ferrous (copper base) foundry industry (11s. 3d.).

METALS FOR DIESEL ENGINES

The present tendency to use cast iron for Diesel-engine crankcases instead of light alloys, as before the war, was advocated by Mr. C. C. Hodgson, chief metallurgist of Leyland Motors, Limited, in a Paper read to the Sheffield Metallurgical Association on April 16. He was speaking on the metallurgy involved in the development of high-speed Diesel engines, and pointed out that the cast-iron crankcase gave a more rigid assembly, and removed the troubles caused by differences in expansion between the cast-iron block and the light-alloy crankcase. The disadvantages of slight weight increase and longer machining time could be tolerated to achieve this benefit. Crankshafts operating at higher speeds required stronger bearing metals, which had a tendency to wear the journals and crankpins. Mr. Hodgson said that nitriding the crankshafts was an excellent way to overcome this.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CAST-IRON SHELLS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—In the May 30 issue of the "F.T.J.," a correspondent asks for a solution of the following problem —"How to keep the core concentric in a shell casting." May I submit the following suggestions. The pattern is made as in Fig. A.

The print is rammed up first, and joint is made at AA; the middle part rammed up to BB and finally the top part.

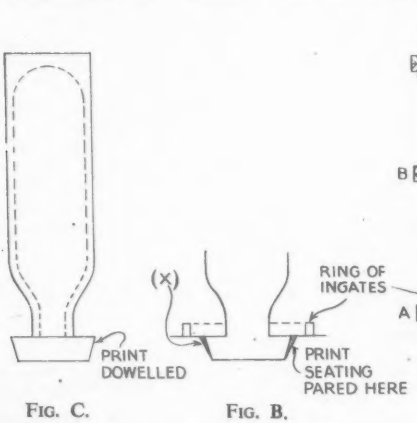

FIG. C.

FIG. B.

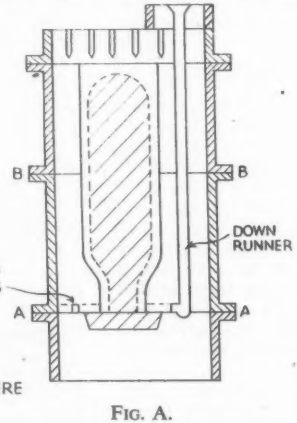

FIG. A.

Assembly.—The core is placed in position in the bottom part. The middle part is then placed on and the thickness tried; any adjustment can be made by slightly moving the core, and at the same time allowing the parting sand to fall down between the mould and the core, and into the print which has been pared away so as to receive it (Fig. B).

The middle part is then lifted off again, and the core is sealed in its print and made firm. The middle is again placed on, tried, and the mould is then finally assembled (Fig. C).

Running of Mould.—From a down runner a ring can be cut or made on the underside of the middle part, and 3 or 4 ingates made to the mould (see X—Fig. B).

Advantages.—(*a*) Greater base to support the core.

(*b*) The metal flowing over the balance or bottom part of the core neutralises any tendency to lift the core.

(*c*) The 3 or 4 ingates distribute the metal pressure equally.

(*d*) Facilitates the finishing of the middle part in the neck of the casting.

Should this be a repetition job it is a matter upon which pattern and mould equipment could be elaborated.

Yours, etc.,

PETER S.

Sheffield.

June 4, 1946.

SECOND REPORT ON THE BASIC CUPOLA*

By Sub-committee T.S.10 of the Technical Council

Constitution of the Sub-committee

The Sub-committee was appointed by the Technical Council on September 6, 1944, following the dissolution of the Melting Furnaces Sub-committee which had initiated the present work on this subject. The Sub-committee is composed as follows:—

MR. L. W. BOLTON, John Gardom & Company, chairman.
MR. N. L. EVANS, Imperial Chemical Industries, Limited.
MR. V. C. FAULKNER, Editor, THE FOUNDRY TRADE JOURNAL.
MR. T. W. HOWIE, United Steel Companies, Limited.
DR. A. H. JAY, United Steel Companies, Limited.
MR. E. MORGAN, Stanton Ironworks Company, Limited.
MR. P. MURRAY, Refractory Brick Company of England, Limited.
MR. E. S. RENSHAW, Ford Motor Company, Limited.
MR. F. L. ROBERTSON, John Summers & Sons, Limited.
MR. S. SPRAY, Stanton Ironworks Company, Limited.
MR. R. GOULD served as a member of the Sub-committee under Mr. Gardom's Technical Council students' scheme.
MR. J. BOLTON, acting secretary of the Institute, was secretary to the Sub-committee.

Mr. Evans and Mr. Murray were co-opted on March 7, 1945. Mr. W. W. Stephenson (United Steel Companies, Limited) served as a member of the Sub-committee from its inception until September 19, 1945, when his resignation was accepted. Mr. E. Shaw (Refractory Brick Company of England, Limited) served as a member of the Sub-committee until his resignation in December, 1945.

Introduction

In the Report of the Melting Furnaces Sub-committee[1], published in 1944, details were given of the use of basic linings in cupolas and the results obtained when using slags of higher basicity than are normally worked with a conventional acid lining. It was shown that with such slags, if conditions in the cupola were reducing, appreciable desulphurisation of the metal would be obtained during melting. With a correctly operated basic cupola, metal can be tapped with a sulphur content in the range 0.03 to 0.05 per cent. Details were also given of some experiments carried out to explore the possibilities of effecting dephosphorisation of metal during cupola melting. The main conclusions drawn from these experiments were that in order to secure removal of phosphorus, oxidising conditions were needed in the cupola. Conditions favourable to desulphurisation were therefore not favourable to dephosphorisation. Silicon when present in the metal to be dephosphorised was found to inhibit the removal of phosphorus.

Reference was made in the report to the work of Heiken[2], who had found abnormally high carbon contents in metal melted in basic-lined cupolas. No confirmation of this effect was found in the experimental data examined by the Sub-committee. The experimental work described was carried out in cupolas fitted with a continuous tapping arrangement which maintained a relatively large body of slag in the well of the furnace. All the metal had to pass through this slag before leaving the cupola and no appreciable quantity of metal was retained in the well. It was pointed out that this factor may have influenced the results obtained.

Following the presentation of this Report, the Basic Cupola Sub-committee was appointed to examine these matters further.

The Basic Cupola in the Cupola-converter Process

In the Report of the Melting Furnaces Sub-committee it was suggested that the possibility offered by the basic cupola of obtaining some measure of dephosphorisation would be of benefit in the cupola-converter process and would enable steel scrap of higher phosphorus content to be used. In the production of steel castings by this process no removal of phosphorus occurs and it is therefore essential to keep this element to a minimum in the cupola metal. The charges used normally consist of low-phosphorus pig-iron with appreciable proportions of steel scrap, and under wartime conditions difficulties arose in producing cupola metal of suitably low-phosphorus content. The majority of steel castings specifications call for phosphorus not exceeding 0.06 per cent. and a means of reducing phosphorus from 0.08 to 0.04 per cent. during cupola melting would be of very great benefit. It should be noted that although this is only a removal of 0.04 per cent. phosphorus, it is in this case equivalent to 50 per cent. of the element present. Previous work on dephosphorisation in the basic cupola, discussed in the Report of the Melting Furnaces Sub-committee, was concerned with metal of appreciably higher phosphorus contents.

Through the courtesy of Mr. P. H. Wilson, of the Stanton Ironworks Company, Limited, the Sub-committee has been able to examine the results of some experiments carried out at the Stanton Gate Foundry of the Ministry of Supply. The investigation was made under the supervision of Mr. S. Spray, to whom the thanks of the Sub-committee are also due. In these experiments a cupola melting charge of 100 per cent. steel scrap, for steel making by the converter process, was provided with a basic lining, particularly with a view to examining the possibilities of obtaining

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* A Report submitted to the 43rd annual meeting of the Institute of British Foundrymen, but not verbally discussed.

Report on the Basic Cupola

dephosphorisation during melting. In the normal operation of this plant, which has been described by Fassotte[3], a minimum of silicon is added with the cupola charges and the metal as tapped contains only 0.15 to 0.20 per cent. Si. The phosphorus content of the cupola metal, using the average run of steel scrap available at the time of the experiments was 0.065 to 0.085 per cent. In view of the known inhibiting effect of silicon on phosphorus removal, it was considered that conditions in this plant were particularly favourable for the study of cupola dephosphorisation.

A monolithic lining of stabilised dolomite was installed generally on the lines described in the Report of the Melting Furnaces Sub-committee. Stabilised dolomite cement was used as a patching material. The cupola was operated with intermittent tapping, the metal being taken in taps of 5 tons. The metal charges used during the melts consisted of 4,000 lb. of steel scrap and 20 lb. of 75 per cent. silicon ferro-silicon. Coke charges were 640 lb. and in attempting to produce basic slags capable of removing phosphorus, various flux charges were used as detailed below. The cupola had an internal diameter of 7 ft. 6 in. and a nominal maximum output of 22 tons per hr. from an all-steel charge, and was designed with a deep well to facilitate maximum carbon pick-up.

Details of Cupola Melts

A first melt on the cupola showed that a slag of satisfactory fluidity could be produced with a limestone addition of 120 lb. per ton of metal. For the next melt it was decided to increase the limestone to 180 lb. per ton, the aim being to produce a slag of high basicity. This melt at first proceeded normally, but three hours after the blast was put on when the slag hole was opened, no slag appeared. Soon after this the appearance of the metal indicated that conditions in the cupola had become highly oxidising and the metal produced was covered with a thick oxide layer in the ladle. An hour later when no slag had been formed capable of running from the furnace, the limestone addition of 180 lb. per ton was replaced by an addition of magnesian limestone (dolomite) at a rate of 120 lb. per ton. In order still further to increase slag fluidity additions of fluorspar were made to the next six charges, a total of 400 lb. of this material being used.

These alterations to the flux charges resulted in a return of satisfactory cupola conditions. During the period when conditions in the furnace were highly oxidising, the metal tapped was not considered suitable for use in the converter. Ladles 8-13 were for this reason poured into pigs. The analyses of the metal produced on this melt are given in Table I.

Three more melts were carried out using varying amounts of magnesian limestone and fluorspar in the charges. Experience showed that in the early stages

TABLE I.—*Details of First Experimental Charge at Stanton Gate*

CUPOLA METAL

Time	Ladle	Temp.* Deg. C.	T.C	Si	Mn	S	P
6.50	1	1,450	3.55	0.13	0.43	0.115	0.068
6.58	2	1,460	3.60	0.09	0.47	0.100	0.058
7.15	3	1,460	3.47	0.10	0.33	0.106	0.046
7.25	4	1,460	3.33	0.14	0.35	0.096	0.037
7.41	5	1,430	3.38	0.09	0.41	0.091	0.034
8.45	7	1,440	3.30	0.09	0.50	0.096	0.033
10.10	9	1,440	2.65	0.08	0.45	0.110	0.037
10.25	10	1,450	2.70	0.06	0.37	0.106	0.035
11.30	Slag 1						
1.26	14	1,420	2.65	0.10	0.45	0.110	0.077
1.30	Slag 2						
2.40	17	1,410	2.65	0.07	0.58	0.110	0.078
2.45	Slag 3						
3.15	19	1,390	2.73	0.08	0.59	0.115	0.074

CUPOLA SLAGS

	SiO_2	Al_2O_3	FeO	MnO	CaO	MgO	P_2O_5	SO_3	S
	20.0	13.9	14.3	8.6	30.3	10.6	0.5	0.4	0.3
2	17.4	13.6	9.9	8.9	33.0	12.1	0.5	Nil	0.5
3	16.2	11.6	2.7	7.4	38.2	14.5	0.3	N	0.8

* Optical pyrometer reading plus 100 deg. C. correction.

of a melt, the temperature developed was insufficient to fuse a very high lime addition. This is considered to be the explanation of the trouble experienced on the melt described above. On these melts no unduly oxidising conditions were developed in the cupola and dephosphorisation did not take place to any marked degree.

On a sixth melt, 120 lb. of magnesian limestone per ton was used on the first six charges and at a rate of 160 lb. per ton on the remainder. Fluorspar was added at a rate of approximately 10 lb. per ton. In an attempt to produce a more oxidising condition the blast volume was increased as high as 25 per cent. above normal, *i.e.*, from 10,000 cub. ft. per min. to 12,500 cub. ft. per min., for the major part of the blow. The compositions of samples obtained on this melt are given in Table II.

Discussion of Results

On all these melts some measure of dephosphorisation and desulphurisation was obtained. It is not possible to assess the amount of reduction, but support is given to the statement in Table II, which shows comparison with a firebrick lined cupola using similar charges. It is also confirmed by the higher P_2O_5 and sulphur contents of the slags from the basic cupola.

TABLE II.—*Details of Sixth Experimental Run at Stanton Gate*

CUPOLA METAL

Time	Ladle	Temp.* Deg. C.	T.C	Si	Mn	S	P
7.10	1	1,420	3.60	0.17	0.24	0.192	0.058
7.20	2	1,450	3.46	0.16	0.24	0.168	0.053
7.30	3	1,470	3.52	0.14	0.23	0.134	0.056
7.45	4	1,460	3.17	0.15	0.30	0.187	0.063
8.00	5	1,450	3.22	0.07	0.29	0.154	0.055
8.25	Slag 1 (40 cwt.)						
8.45	7	1,470	3.30	0.07	0.44	0.086	0.050
9.20	9	1,440	3.33	0.07	0.41	0.106	0.060
9.58	11	1,460	3.19	0.05	0.25	0.110	0.058
10.15	Slag 2 (30 cwt.)						
10.45	14	1,460	3.00	0.10	0.45	0.106	0.062
11.03	Slag 3 (50 cwt.)						
11.40	17	1,480	3.06	0.05	0.43	0.110	0.052
12.35	20	1,450	2.89	0.06	0.59	0.101	0.058
1.05	Slag 4 (50 cwt.)						
2.00	23	1,450	3.11	0.04	0.60	0.106	0.066
3.15	26	1,430	2.81	0.03	0.51	0.129	0.058
3.15	Slag 5 (80 cwt.)						
3.40	27	1,430	2.68	0.04	0.36	0.110	0.046
4.00	28	—	2.98	0.03	0.47	0.106	0.046
Average analysis			3.15	0.08	0.38	0.127	0.056
Average analysis of metal from firebrick-lined cupola using similar charges			2.85	0.15	0.37	0.200	0.070

CUPOLA SLAGS

	SiO_2	Al_2O_3	FeO	MnO	CaO	MgO	P_2O_5	SO_3	S
1	26.8	14.8	2.4	5.2	30.2	18.4	0.23	Nil	0.5
2	23.8	16.0	1.9	4.6	32.3	18.8	0.28	Nil	0.6
3	24.2	15.5	2.3	5.6	30.8	18.6	0.16	Nil	0.7
4	23.8	15.7	3.0	6.3	31.9	17.4	0.23	Nil	0.5
5	23.6	16.2	2.4	5.8	31.2	17.4	0.27	Nil	0.6
Average analysis of slag from firebrick-lined cupola	49.0	17.5	2.5	8.8	20.5	0.9	0.04	—	0.15

Optical pyrometer reading plus 100 deg C correction

Report on the Basic Cupola

It does not, however, appear that maximum desulphurisation was obtained concurrently with maximum dephosphorisation.

For maximum dephosphorisation severely oxidising conditions were required in the cupola. Reference to Table I shows that at one period of this melt rather more than 50 per cent. of the phosphorus was being removed from the metal during cupola melting, but under these conditions of operation, the metal produced was continually scummed over and unsuitable for use in a converter. Analysis of the slags produced in the basic cupola revealed the presence of P_2O_5. The amount of phosphorus present in the cupola slags is considered sufficient to account for the whole of the phosphorus removed from the metal. Except when melted under highly oxidising conditions the metal showed abnormally high carbon contents. Using a normal firebrick-lined cupola the 100 per cent. steel charge yields carbon contents of 2.9 to 3.2 per cent. With a basic lining the carbon varied between 3.1 and 3.85 per cent.

As previously stated, the cupola was operated with intermittent tapping and under normal conditions the slag is removed at regular intervals during the melt. With the high limestone addition needed to produce a basic slag it was obviously wasteful to remove the slag before it had been fully utilised. Attempts were therefore made on some of the melts to maintain a body of slag in the well, but these were unsuccessful, due to enlargement of the tap hole which allowed slag to be tapped with the metal. It is thought that the use of intermittent tapping which allows longer contact between the metal and coke in the well of the furnace may account for the difference in the carbon contents obtained on these experiments compared with those reported on by the Melting Furnaces Sub-committee, in which a continuous tapping system was employed.

The results of these trials suggest that a continuous tapping system of a type which maintains a relatively large body of slag in the well is to be preferred for maximum removal of sulphur and/or phosphorus as contact between slag and metal can by this means be increased and more constant reaction conditions are obtained.

Lining Life

The melts confirmed that the stabilised dolomite material is satisfactory as a lining for a cupola and the stabilised dolomite cement is a satisfactory patching. The lining material and more especially the patching were more expensive than the conventional acid materials. A total of 663 tons of metal was melted with an average consumption of refractories of 69 lb. per ton of metal melted which includes an estimate of the patching required to repair the lining after the final melt. The lining failed through flaking of the monolith, which first appeared after the third melt and grew progressively worse. It is, however, pointed out that the efforts made to produce oxidising conditions in the cupola during the experiments may have increased the rate of lining attack.

Conclusions

The experiments described above confirm that some dephosphorisation can be obtained during melting in a basic-lined cupola. The abnormally high pick-up of carbon reported by Heiken[2] is also confirmed and it was found that appreciable desulphurisation can be obtained simultaneously with dephosphorisation. With high-steel charges of the type used in the cupola-converter process there is no difficulty in producing conditions under which phosphorus may be removed but with this type of charge there is a serious danger that such conditions will result in the production of metal unsuitable for further processing.

It is probably quite widely known that the present series of investigations into the possibility of effecting dephosphorisation were initiated owing to the serious difficulties in the raw materials supply position which arose in 1940-41. In such emergency conditions it was possible to consider the operation of processes which in normal times would not be economic. The termination of hostilities has to some extent altered the position, but the Sub-committee wish to draw attention to the importance to the national interest of developing a satisfactory commercial method. They regret that the cupola plants in which the experimental work so far reported by them has been done are now no longer available for these purposes. It has been shown, however, that under carefully controlled conditions, dephosphorisation is practicable and the Sub-committee wish to place on record their opinion that, given further opportunities for experiment, a commercial process might be developed, and that it is of vital importance to the industry as a whole that this work be proceeded with.

The present state of the Sub-committee's knowledge suggests that a manufacturing process such as they believe to be possible might not depend solely on dephosphorisation in basic-lined cupolas and in view of their present lack of cupola facilities and on account of certain encouraging experimental results which have already been obtained they are turning their main attention to an examination of the possibility of desulphurising and dephosphorising in basic-lined ladles. It is expected that their findings will be published at a later date.

REFERENCES

1 The First Report on the Basic Cupola by the Melting Furnaces Sub-committee. Proceedings, Institute British Foundrymen, 1943-44.
2 Production Results with a Basic-lined Cupola. "Die Giesserei," Nos. 43 and 44, Oct. 28, 1934. FOUNDRY TRADE JOURNAL, vol. 72, No. 1437, March 2, 1944.
3 Developments in the Design and Use of Side-blown Converter Plants. Journ. I. and S.I. Vol. CL.

AN ORDER for 315,000 ft. of cold-drawn precision aircraft tubing for the construction and repair of machines for the Argentine Air Force has been placed with Tube Investments, Limited, by the Argentine government aircraft factory at Cordoba. The contract will be undertaken at the Oldbury works of Accles & Pollock, Limited. This is the first aircraft order of its type to be placed by a South American country with Britain since 1937.

DEFINING SOME FOUNDRY TERMS

By S. Lewis

The diversity of terms used in the founding of castings can bewilder the uninitiated, such as engineers, draughtsmen, metallurgical students, and those who, whilst not being strictly practical foundrymen, may be closely allied to, or directly connected with the foundry industry. While it is not the responsibility of such people to produce sound castings, an understanding of the process involved and difficulties encountered can be attained by a study of some of the terms used by the foundry in describing common defects in castings. Here, different terms are sometimes used in order to convey the same meaning; such terms, whilst correct to the foundry, may be obscure and misleading to the layman.

Confusion could arise in investigation and inspection reports if different terms were used by different people in describing the same defect. If a term is used loosely or in a general sense it may be found to apply only to specific cases when reduced to an exact definition. Taking a series of terms used in describing defects or faults in castings where the casting is not fully formed, the layman hears such terms as cold lap, cold shut, short pour, short run, mis-run, faint and bare. In endeavouring to determine exactly what is denoted one finds that a cold lap is defined as "Two streams of metal failing to flow and fuse into each other." It would appear, therefore, that "cold lap" and "mis-run" are not synonymous terms—in one case the metal has met and failed to unite properly, and in the other case the metal has failed to meet or contact with either more metal or with the mould extremity.

Another Example

Another defective condition described by numerous terms is that where the metal of a casting is not continuously united, having cavities or tears in its structure. This condition is often described by such terms as shrink, draw, pull, unsound, ripped, hot tear, spongy place, porosity, disturbed, contraction cavity, sink, pipe and crack. Seeking definition, it seems to the non-foundryman that a term such as "shrink" or "draw" does not mean exactly the same as "pull" or "tear," one denoting cavities or voids and the other a crack or irregular fissure—both, however, are the result of liquid contraction effects. One may contribute to the other, for in attempting to cure one defect the other may occur or be aggravated. A hot tear on inspection will show signs of oxidation, whereas a cold or "tension crack" is not usually oxidised. A shrink often shows a dendritic structure. Apparently many different terms having similar meanings are used in the foundry to cover a variety of causes, depending upon conditions which differ perhaps but slightly, and are all very involved and sometimes interdependent.

The term shrinkage itself is ambiguous when used without qualification, for according to different authorities shrinkage can be subdivided into liquid, solidification and solid shrinkage, depending upon whether the metal is an alloy or pure. Liquid shrinkage is that which is made up for by "feeding." Solid shrinkage or contraction—the pattern-maker's contraction allowance.

Mould Defects

Mould defects covered by a series of terms such as fin, flash, rag, offset, sided, shift, twist and cross joint are closely connected and could be defined as "oversize metal at a mould joint or parting, due to errors in location of mould parts," all arising from "mismatching" of some part or parts of the mould. Another oversize defect is that due to ferrostatic pressure on mould sandface, and such terms as "strain" or "swell" are used here.

"Blown" castings, or castings with "pin holes," gas, sand and slaghole defects, also dirt and inclusions, could be graded as defects arising from "voids or inclusions caused by foreign matter or gases." Such defects as "washed, scabbed, flaked, streaked, seamed, blistered, rough, blebs, buckle and clagging" might be covered by a definition such as "a rough irregular projection in or on the surface of a casting."

The layman finds it easier to define the effect than does the foundry the cause. It would seem, however, that with careful use of some terms, and/or even some standardisation of existing ones, then the foundry, the inspection, and the laboratory would all talk the same language. Thus, if terms could be used which are universally recognised, discussions which arise concerning properties or defects of castings would be simplified. Common defects could probably be distinguished and designated by simple inspection methods as apart from laboratory investigation.

A glossary of some of the standard terms might be compiled and made available as done by J. F. Buchanan 30 years ago. These thoughts, right or wrong, by provoking opposition may be of some service in the application of fewer and more correct terms in discussing foundry problems. One thing is certain, whether or not some standardisation of technical and practical founding terms is ever achieved, foundrymen will continue to use their own pet expressions in the pursuance of their craft.

NEW CATALOGUE

Core and Mould Drying. Foundry Refractories, Limited, 9, Midland Road, Wellingborough, have sent us an eight-page pamphlet which illustrates and describes the "C.R.A." mould drying system. The method is based on the recirculation of a portion of the hot air through a contiguous stove, which, through the use of warm instead of cold air, obviously introduces a fuel economy. The reviewer believes that the pamphlet would be more striking if it had been carried out in a colour other than red, and he would suggest blue would have been preferable.

Battelle Memorial Institute has recently developed a new gold alloy containing 12 per cent. beryllium. The alloy is stated to have good casting properties and superior wearing properties.

F

DUNITE DEPOSITS

A party, led by Mr. George M. Menzies, managing director of North British Steel Foundry, Limited, Bathgate, visited the dunite deposits of Maaruig and Grose Clett on the island of Harris recently. Mr. Menzies is willing to carry out experiments to see whether the Harris dunite can be used economically in foundries.

Dr. Haldane, Geographical Society, pointed out the extent of the deposits, which appear to have sufficient reserves for a sizable industry, if uses for the material can be found. Mr. Maclay, of Drysdale & Company, Limited, Glasgow, who worked the felspar during the war on behalf of the Ministry of Supply, is looking into the technical problems of quarrying and shipping the rock, and Mr. Robert H. S. Robertson, Research and Scientific Adviser to the Scottish C.W.S., Limited, approached the problem from the angle of finding employment and of scientific resource development.

Dunite is an ultrabasic rock, containing a high proportion of the mineral olivine, a silicate of magnesium and iron. The rock is highly refractory if the iron content is not too high and the impurities are not too great. Commercial uses for this rock were first worked out at the Government Laboratory for Investigation of Raw Materials in Oslo, Norway, under the direction of Dr. V. M. Goldschmidt, who, since he has been in Britain, has paid some attention to Scottish deposits.

There would seem to be a strong case for a Government-sponsored Scottish Raw Materials Research Station in Scotland, with laboratories in districts like Lewis and Harris, where some of the experimental work could be carried out.

TRADE CATALOGUE LIBRARY

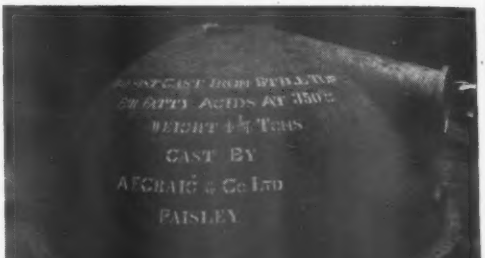
The Birmingham Exchange, which has for the past 85 years provided the iron, steel, coal, metal and allied traders of Birmingham and district with facilities for the development of local and export trade, has instituted a new department which shows the progressive foresight of its committee and will probably develop into an important branch of the Exchange as soon as its facilities become known to the traders.

In the reading room in the Exchange, a library of trade catalogues has been arranged. These catalogues are indexed, whereby the enquirer can find particulars of the products of members of the Exchange. This collection cannot yet claim to be complete. Paper restriction has resulted in many firms being without up-to-date catalogues, but when the restrictions have been removed these deficiencies will be made good. The present collection, consisting of several hundred catalogues, covers an amazing range of products, from aluminium to zinc, as well as foundry and mining, gas and electrical equipment; railway appliances; non-ferrous manufactures, and the like.

The members of the Birmingham Exchange will undoubtedly appreciate and use the library, but the committee desire it to be known by traders, exporters and others, that the staff will give every assistance regarding the sources of supply of the products of its members.

ANOTHER NI-RESIST CASTING

An article which appeared in our issue of June 6, described a large casting made in Ni-resist austenitic cast iron for Lever Bros. by the Widnes Foundry & Engineering Company, Limited. The firm of A. F. Craig & Company, Limited, Caledonia Engineering Works, Paisley, Scotland, have also had experience of casting heavy castings in this alloy, one of which is shown in our illustration. This shows a still-top casting 9 ft. 6 in. dia., over the flanges, and 4 ft. 6 in. deep—the thickness of the metal varying from 2 in. at the bottom to 1¼ in. at the top. The weight of the casting is 4¼ tons finished and 5¼ tons as cast before the shrink head had been cut off. A still-bottom casting of similar dimensions has also been made for the same plant, which weighed 6¼ tons as cast. The results obtained with these castings have been so successful that repeat orders have now been placed.



MAKING OF CAST-IRON CRANKSHAFTS

The Council of Ironfoundry Associations, Derbyshire House, Belgrove Street, London, W.C.1, have sent us a copy of a film strip entitled, "Making of Cast-iron Crankshafts." The pictures have been made with the co-operation of Mr. R. B. Templeton at Ealing Park Foundry. The specific object of this production is to propagate interest amongst ths country's youth in foundry practice by visual appeal. This has been well done, and any criticism of intrinsic technical value is beside the point. A properly connected story is given of manufacture from the blue print to the finished articles, plus a striking application—that of the Southern Railway's West Country Pacific type of locomotive. Readers who can usefully display these pictures before youth audiences are invited to write to Mr. T. E. Parkinson, at Derbyshire House.

HIGH-STRENGTH ALUMINIUM-BRONZE CASTINGS*

By JEAN DUPORT

It is proposed in this article to deal with a few problems associated with the production of high-strength aluminium-bronze castings. The tensile strength should not be less than 38 tons per sq. in. associated with an elongation of the order of 30 per cent. It should be pointed out that these figures are remarkably high, and they only refer to small chill-cast castings. Further, it is necessary, in order to ensure results of this standard, to have available a specialised technique and proper materials. French foundries conforming to these requirements are few and far between, for it is not easy to find technicians skilled in their control; their tooling up is not too easy, and there are difficulties as to amortisation.

It is not possible to give here a complete story of the whole of the technical reasons which would explain the difficulty involved in simultaneousy obtaining aluminium-bronze castings, both of high tensile and good elongation, as it would involve a too lengthy discourse. However, it is worth while to draw attention to two of the most important difficulties so as to give an idea of the complexity of the problems which are encountered in this particular phase of metallurgy.

Choice of the Aluminium Content of the Alloy

So far as binary aluminium bronzes are concerned (*i.e.*, those composed exclusively of copper and aluminium), it is the aluminium content which controls the essential characteristics of the alloy. From a study of the equilibrium diagram, it would appear that for aluminium bronzes of low Al content (theoretically less than 9.8 per cent.), there should only be revealed in the micro-structure of the castings so made the presence of the constituent which is malleable and ductile, but of low strength. In practice, it is necessary to ensure that this 9.8 per cent. content is exact so as to be certain of getting the above conditions, and one has then recourse to a range of alloys of low Al-content, alloys which do not yield the whole of the desired mechanical characteristics. The tensile strength is considerably affected. If the aluminium content is higher than 9.8 per cent., then castings normally cooled will contain the δ constituent, which is notoriously fragile. If this happens, it becomes necessary to carry out a relatively costly and delicate heat-treatment. The solution obviously consists of choosing an Al content of about 10 per cent., so as to ensure in the final structure after heat-treatment a suitable percentage of the α and β constituents, and simultaneously with them adequate tensile and elongation. Thereby there is an exact compromise so as to find between the two, characteristics which virtually vary constantly in the opposite directions. The more the α constituent is present in the final structure, the higher the malleability of the metal and the greater the elongations, with distinct detriment to the tensile strength. On the other hand, the more of the β constituent present, the lower the elongation and the greater the tensile strength.

The final contents of the α and β constituents will depend on the temperature chosen for quenching, which ought to be carried out between 800 and 600 deg. C., it being understood that the quantity of α increases progressively with the lowering of the quenching temperature. In any case, quenching should be carried out at a temperature higher than 570 deg. C., so as to avoid the precipitation of the eutectoid containing the fragile constituent.

Determination of the Ternary or Quartenary Constituents of the Alloy

The various elements which can be added to aluminium bronze have a more or less marked effect on the mechanical properties, but here again one notes, as was the case with aluminium, the difficulty of simultaneously increasing, and by the same action the tensile strength and the elongation. What follows is a rapid review of the influence of the principal elements often used in connection with aluminium bronze.

Iron.—The principal use of this element is in the preparation of alloys suitable for the production of thick-sectioned sand-cast components. Its outstanding benefit is its ability to counterbalance the effect of "recruit spontané" [auto-tempering] in cases where thin-walled die castings are being made. However, its presence remains desirable, for beyond its usual role of refining the structure, its influence on the mechanical properties is quite clear. If it is added to aluminium-bronze, and for contents less than 4 per cent., an increase in the tensile strength of 2 to 3 tons per sq. in. for each 1 per cent. addition can be expected. However, a foreign author, Mr. Vickers, has cited a case where additions reaching up to 7 per cent. of Fe were of interest. In this case he referred to small castings demanding high strength, but with only average elongations. (This is not quite the case with which the Author is dealing, since he is seeking distinctly high elongations.) The bronze in question was made up of 83 per cent. Cu, 10 per cent. Al, and 7 per cent. Fe, and the mechanical properties obtained were 40.5 tons per sq. in.; elongation on 2 in., 19.5 per cent.; and reduction of area, 21.2 per cent. The presence of iron can be of real interest in castings required to have good properties at elevated temperature, because this element has the advantage of retarding grain growth on heating.

Manganese.—It is generally conceded that this element exercises a beneficial role as a deoxidiser. Used to the extent of 0.20 to 0.30 per cent., it seems to help with the shifting of the alumina which invariably forms during melting; also, it helps to deoxidise the alloy. Its influence on the mechanical properties is somewhat obscure, for whilst certain research workers have obtained a slight improvement in the tensile strength and the elastic limit, without notably affecting the elongation, others report a slight increase in elongation and resillience, without noticeably increasing the tensile strength. Thus, it is necessary to be very careful when adding more than the normal quantities used for deoxidising (0.2 to 0.3 per cent.), as there is a risk of increasing foundry troubles—already not inconsiderable—when handling aluminium bronzes.

* Translated from "Fon derie," April, 1946.

Aluminium-bronze Castings

Tin.—Apparently tin widens the solidification range of the corresponding binary alloy. This is important; as it is well known that with normal compositions of aluminium bronzes, the freezing range is practically zero, and from this fact the making of thick-sectioned castings is difficult. Tin increases the maximum strength, but distinctly lowers the elongation. Put another way, tin seems to play the part similar to aluminium. The work of Read and Greaves has provided a means of determining a sort of "coefficient of equivalency" between tin and aluminium. Thus 1 per cent. of tin corresponds to 0.6 per cent. in the *a* field, and to 0.5 in the β field. From the viewpoint of corrosion, tin can increase the resistance to soft and sea water of aluminium bronze.

Lead.—Additions of this metal to the extent of 1 to 2 per cent. have been put forward. The Author does not believe they are of interest unless the castings made exhibit difficulty in machining, for it would appear that lead does not alloy properly and aids machinability. It may be that lead is interesting for the making of certain bearing castings.

Nickel.—It is principally on account of its influence on the corrosion-resisting properties that nickel is used in aluminium bronzes, for if there is a tendency to increase the maximum stress, it considerably complicates foundry difficulties, as it has a deleterious influence on the "life" of the metal.

Silicon.—According to the latest reports, silicon is being added to certain American aluminium bronzes, but no precise data have reached the Author.

Conclusion

Finally, it is desirable to stress the complexity of the making of aluminium bronzes showing high mechanical properties, and the difficulties to be overcome. The Author believes that it would be extremely hazardous for a foundry having no experience in this direction, and possessing no suitable means for manufacture and research, to embark on this particular line.

PUBLICATION RECEIVED

Sir John Cass Technical Institute, Jewry Street, Aldgate, London, E.C.3—Prospectus, 1946-47.

The new principal of the Sir John Cass Technical Institute—Dr. A. M. Ward—who has replaced Mr. George Patchin (retired), in sending us this calendar, points out that the department of metallurgy, under the direction of Mr. L. Singlehurst Ward, is now organised to give tuition for all the recognised examinations in this subject and in the *advanced* grades of foundry practice. Both full-time and evening classes are available.

MR. FRANK H. VAUGHAN, chairman and managing director of Vaughan Bros. (Drop Forgings), Limited, Willenhall, has promised £1,000 towards an appeal for £20,000 to provide a memorial hall for the town.

LOOSE LIFTING-STAPLES FOR CORE IRONS

By W. G.

A common sight in the yards of jobbing foundries is that of accumulations, more or less, of pieces of scrapped core irons with lifting-staples attached to them, the practice in most foundries being to cast the core irons round the staples. Thus, the staples become immovable fixtures, and when trying to free them they offer irritating resistance to hammer blows, the easiest way to salvage them being either to saw or cut them off with a chisel.

If no immediate instructions are given, and as it takes time to deal with them, the workman in charge of the scrap iron, breaks what he can of the core iron, then impatiently flings the remaining pieces with the staples fast in them to one side, hence the accumulations.

A better method is the one of employing loose lifting-staples. These are hooked under a bar of the core

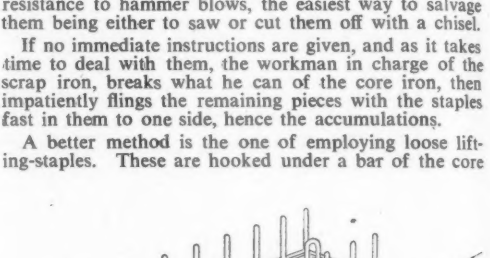


FIG. 1.

iron when it is ready for use, an example of which is shown in the sketch. They have advantages over the "cast-in" staple in that they can be used any number of times, are easy to adjust, and are not dumped on to the cast iron scrap pile when they are no longer required. For example, the core iron here represented is one of three, six staples being required for the three cores which make up a set for the mould. As two moulds were made and it was necessary to break the core irons in the casting, the same six staples were used again. By this it will be seen that a saving of time and material which would be required to make six more lifting-staples is an item of economy that could be easily multiplied.

Experience has proved that it is quite practical to use loose lifting-staples for all sizes of cores, the only point to keep in mind being the strength of the iron used for the staples. The staples here shown are cut from a length of ½ in. iron and when rammed tight with oil-sand and baked in the core oven, become firmly cemented to the iron and can only be released by smashing the core to pieces.

THE CHEMISTRY AND MECHANISM OF STEEL PICKLING*

By BRIAN N. REAVELL, B.Sc., A.C.G.I., M.I.Chem.E., A.M.I.Mech.E.†

(*Continued from p.* 141.)

Continuous Pickling

The earliest types of continuous plant were applied to the pickling of steel strip. The continuous production of the strip from the rolling mill is ideally suited for utilisation in a long acid bath through which it is drawn at a high speed. Suitable washing and neutralising baths follow the pickling bath in a continuous line and no agitation of the steel is necessary owing to the turbulence set up in the bath by the rapidly moving strip. Such plants have been working for many years in the larger steelworks in Europe and in the United States of America. A recent development of the continuous strip pickling plant is illustrated in Fig. 4.

The illustration shows the pickling tank with the covers removed from a portion exposing the rollers over and under which steel strip is passed. In continuous plants of this sort, which may be completely enclosed, the removal of fume is a simple matter and the draughting fan may be seen at the end of the tank. The plant as illustrated is 90 ft. long, and one feature of this plant is the use of electrolytic heating which is achieved by immersing electrodes of Keebush Grade "G," which is an electrically conducting plastic material, in the acid. Another interesting feature is the shallow depth of the acid tank, and the employment of a continuous flow of fresh acid in at one end of the tank and out at the other, working countercurrent to the flow of steel strip.

Another type of continuous pickling plant which has proved extremely satisfactory during a number of years of operation is the spray pickling plant, shown in Fig. 5. This plant comprises endless belts or conveyors passing through an enclosed chamber in which acid is sprayed on to the parts to be pickled. The spray is obtained by means of jets which are fed from a pump drawing acid from the bottom of the chamber. Constant circulation of the acid takes place and filters are arranged to remove sludge and scale from the acid before it is sprayed into the chamber. It will be appreciated that, not only has this type of machine the advantage of continuous operation with consequent low handling charges, but also the pickling rate is speeded up by virtue of the jets of acid which strike the steel parts with considerable force so tending to dislodge scale more easily and rapidly than would be the case in a batch operation. These machines can be adapted to handle a variety of shapes and are of great importance where hollow ware is being pickled, since the acid jets penetrate inside as well as covering the outside of the parts. When hollow ware is pickled by direct immersion in acid baths it is virtually impossible, even if the parts are agitated, to ensure uniform rate of pickling both internally and externally.

For handling very small parts, of dimensions in the order of 6 in. in length to 3 in. in diameter, continuous rotary pickling machines are used, and an example of such a machine is shown in Fig. 6. The machine comprises three sets of perforated drums dipping in an acid tank, a wash tank and a neutralising tank. Each drum has an internal Archimedean screw. Material is fed into one end, and as the drums rotate, the material is driven forward by the screw, passing from one drum to the next, finally discharging pickled, washed, and neutralised. In practice the machines are completely encased and connected to a draughting fan so that no fume or steam can escape into the pickle shop.

Sheet steel if large size is usually pickled in a batch process, but when large outputs are required, special machines are available which may be described as working on a continuous-batch system.

*A Paper read before the annual meeting of the Institute of Vitreous Enamellers.

†The Author is managing director of Kestner Evaporator and Engineering Company, Limited.

FIG. 4.—KESTNER STRIP PLANT.

Mechanism of Steel Pickling

Such a plant is illustrated in Fig. 7. The steel sheet is loaded by hand on to carriers suspended from an overhead chain conveyor which travels the carriers through the pickling, neutralising, and washing tanks. Since the carriers must remain for a required time in the pickle tank, it follows that the movement of the conveyor is intermittent, but the only manual operation is the loading of the sheets so that one man can work such a plant and pickle as much as 2 tons per eight-hour shift.

Ancillary Plant

Properly-designed and suitably constructed ancillary plant is most important. An expensive modern pickling plant will not justify its existence unless the storage and handling of the acid has been given proper thought. Even more important is the question of heating the acid, removing the steam and fume from the top of the acid tank, and disposing of the spent acid effluent.

Acid Storage and Acid Handling

In all but the smallest of pickling plants it is preferable to install an acid storage tank of sufficient size to take the contents of a standard acid road or rail wagon. This obviates the difficulties in storing numbers of carboys, and the ever-present risk of breakage when handling the carboys. The acid store tank may be placed above the ground on a suitable platform and arranged to feed into the pickling tank by gravity, in which case it must be pumped from the tank or rail wagon into the store tank. This is generally preferable to the alternative of placing the store tank below the ground level as this involves pumping from the store tank to the pickling tank, which in turn involves the use of an acid pump running intermittently. There are some small pickling plants where the use of carboys is necessary for acid storage and in such cases for the sake of safety a suitable carboy discharger should always be employed. Fig. 8 is a typical example and shows a simple apparatus which empties the contents of a carboy, or elevates it to any required height, by means of compressed air, but without subjecting the glass carboy to pressure.

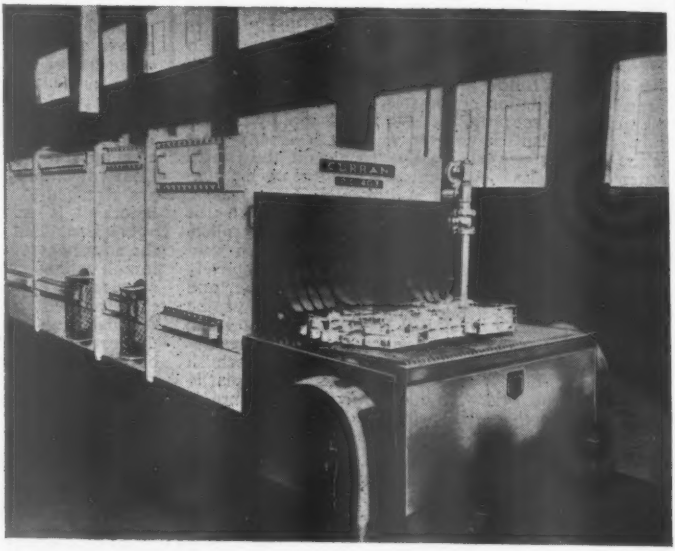


FIG. 5.—CURRAN SPRAY PICKLER.

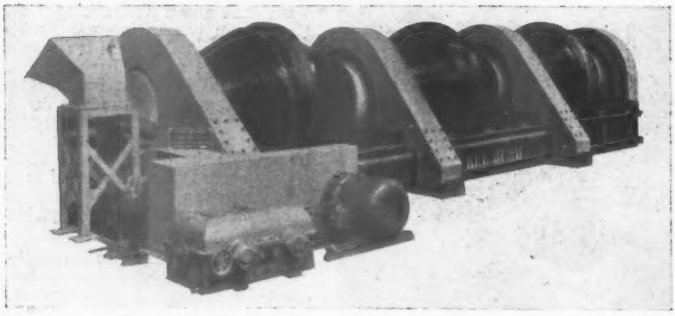


FIG. 6.—KESTNER ROTARY PICKLER.

Acid pumping does not present much difficulty if a properly designed acid pump is used. Special glandless centrifugal self-priming pumps are available constructed entirely of acid-resisting materials such as Keebush, silicon iron, Regulus metal, etc., which can be used with complete safety in handling any of the acids used for pickling. The ordinary cast-iron centri-

fugal water pump should never be used for this purpose because of the rapid corrosion that will inevitably take place.

Acid Heating

The heating of the acid accelerates the rate of pickling and is almost universally adopted for sulphuric acid baths. In many cases, however, cold hydrochloric acid is used because the fumes arising from hot hydrochloric acid are both dangerous and objectionable. However, if a proper fume removal system is adopted, hydrochloric acid can safely be heated to 70 deg. C. or higher and a great improvement in the pickling rate is thereby obtained. The simplest method of heating an acid bath is to inject live steam through a perforated pipe or a special circulatory injector. This method is simple but the dilution of the acid which is caused by the condensing steam renders it uneconomical. As an alternative steam heating coils are sometimes used in the acid bath, but this method is not altogether satisfactory since lead coils are rapidly corroded by hydrochloric acid and their life in sulphuric acid is limited. The short life in sulphuric acid is probably due to the relatively high temperature to which the lead is raised by steam at, say, 50 lb. per sq. in. (148 deg. C.) and the fact that the lead has little mechanical strength at this temperature. Low pressure steam is sometimes used to reduce the stress on the lead pipe, but in this case a large surface of pipe is needed to achieve reasonably fast heating up of a cold bath. Another objection to the use of lead coils for heating the acid bath compared with live steam injection is the absence of any circulation in the bath.

A more recent method which has proved extremely satisfactory and economical is the use of an external heater and a circulating pump. The external heater is generally arranged with the heating tubes made of acid-resisting metal or of glass carried in a steam shell at 50 lb. per sq. in., and the pump is designed to give a rapid circulation of the acid in the bath, causing a satisfactory degree of turbulence.

For small baths heating by electricity is simple and reliable. The heating elements are sheathed in Vitreosil which is not attacked by any of the pickling acids other than hydrofluoric, and the temperature of the acid bath can be maintained to any required degree thermostatically. Fig. 9 shows an example of such a tank.

The use of electrolytic heating has been referred to above and development work on this method may well prove it to be more widely adopted in the future, particularly for continuous pickling plants.

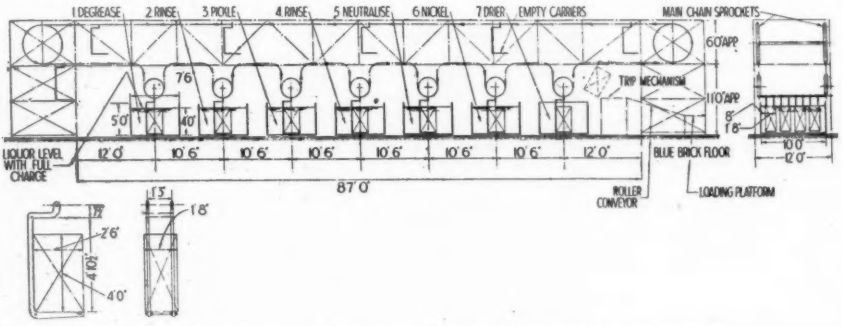


FIG. 7.—KESTNER CONTINUOUS-BATCH PLANT FOR SHEET STEEL.

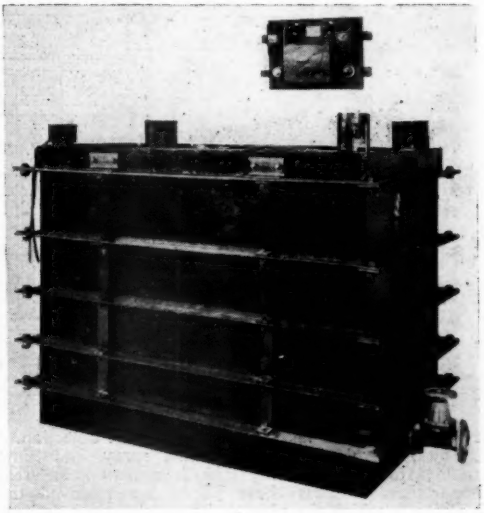


FIG. 9.—ELECTRICALLY-HEATED PICKLING TANK.

Mechanism of Steel Pickling

A further method of heating is the use of gas which is combusted in the pickling tank. This method has been used mostly in the United States of America but has not yet achieved much popularity in this country. The capital cost of such an installation if it is to be safe and free from explosion risk, is very much greater than other methods and for certain work the rapid evaporation which takes place is a definite objection.

The removal of the steam, acid spray, and fume arising from the pickling tank is a matter of great importance. Unless these fumes are removed the building in which the plant is housed becomes difficult to work in, and the structure of the building, and plant itself suffers rapidly through corrosion. Many plants may be seen throughout the country in which various types of hoods and fans have been tried out with a view to extracting the fume. Some of these systems are satisfactory, but unfortunately the majority are not. The matter has been studied scientifically by a number of firms who specialise in ventilating problems, and methods are now available which ensure satisfactory fume removal. The system that has achieved most success is known as lip drafting.

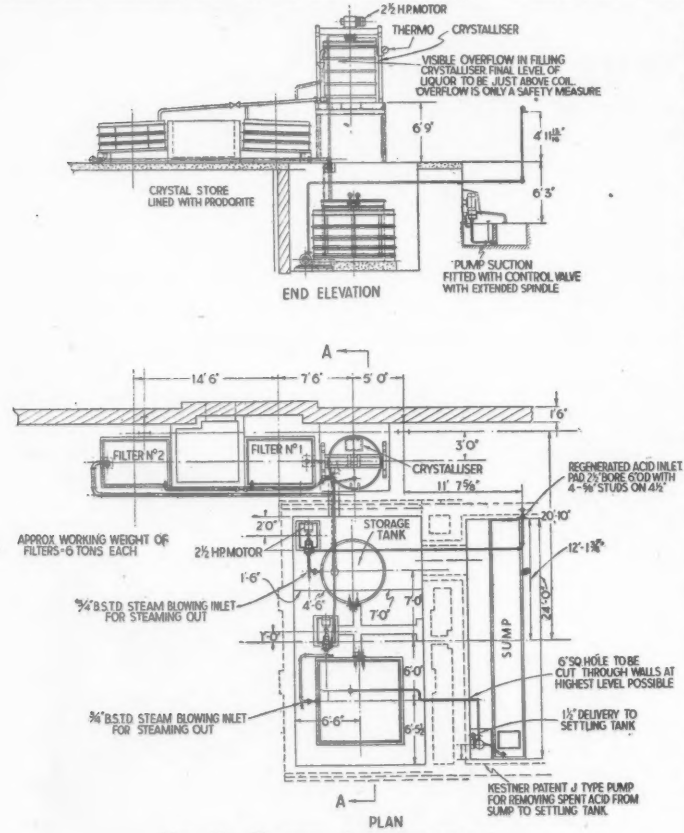


FIG. 10.—KESTNER ACID RECOVERY PLANT.

It is just as important to ensure that the extraction hood, duct and fan are made of acid-resisting material, as it is for the pickling tank itself. All too often these drafting systems are made of steel covered with some acid resisting protective surface, and the fan employed is an ordinary ventilating fan painted with an acid-resisting lacquer. Such a drafting plant will last at the most for a few months and then corrosion begins to take its toll. Soon the hoods, the ducting, and the fan blades are corroded away, and the pickling plant continues to work with the shop full of fumes. The saving in capital cost by using unsuitable materials for the drafting system is not justified.

A few years ago the Author was responsible for installing a drafting system on a pickling tank 30 ft. long, and this was installed in a pickling shop alongside an existing tank of the same size with an old-fashioned drafting system. The new plant was fitted with an axial flow fan built entirely of Keebush acid resisting material and driven by a 2-h.p. motor. The old plant was fitted with a paddle type fan built of cast iron and wood covered with acid-resisting paint, and driven by a 30-h.p. motor. The new plant was started up and has been running ever since, giving really satisfactory drafting. The old plant had never removed the fumes effectively, and was shut down regularly every few months for repairs to the fan. This is perhaps an extreme example, but it does illustrate how chemical engineering principles can help to improve the efficiency of pickling plants as a whole and reduce the upkeep and running costs.

Acid Neutralisation and Acid Recovery

When the acid in the pickling bath is spent it must not be turned into the drain. Legislation in this country makes this an offence liable to heavy penalties. The law has been somewhat relaxed due to wartime

emergencies, but it is being enforced again. The spent acid must either be neutralised, or where possible recovered for return to the pickling plant. This subject is one which has been investigated by many workers, and cannot be adequately covered in this short Paper. Reference should be made to the paper by Mr. Norman Swindin, entitled "The Treatment of Waste Pickle Liquors," read before the Institute of Chemical Engineers last year, which covers the subject very fully.

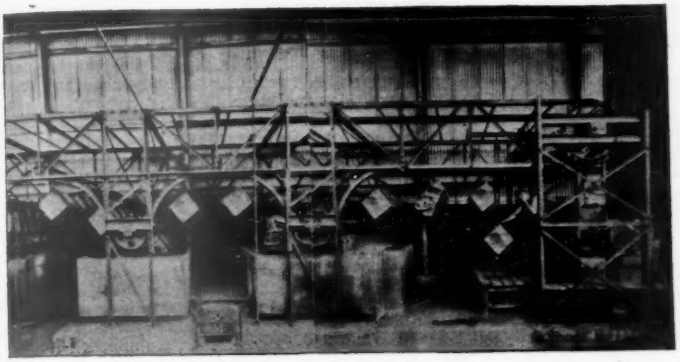


FIG. 8.—CARBOY DISCHARGER.

Whilst the neutralisation of spent acid is a straightforward reaction, for example: sulphuric acid plus lime = calcium sulphate and water, and hydrochloric acid plus lime = calcium chloride and water, the plant needed to carry this out effectively needs as much consideration as the pickling plant itself. From the economic point of view acid neutralisation is far from satisfactory, and on a large plant handling steel strip the annual cost for lime alone may be £22,000. In view of the cost of the lime, the efficiency of the neutralising plant is important. A new method of continuous neutralisation has been evolved which enables the reaction to take place using only the theoretical quantities of lime, as given by the above equations. In the batch methods usually adopted the quantity of lime required is from 50 to 100 per cent. in excess of the theoretical requirement, so that the saving in running cost by the new method would be considerable.

Methods of acid recovery in the case of spent sulphuric acid are highly satisfactory. In one system, used largely in Europe, the ferrous sulphate in the spent acid is crystallised out and the mother liquor returned to the pickling tank for further use. Fig. 10 shows such a recovery plant, which is used in conjunction with a spray pickler of the type illustrated in Fig. 5. The recovery plant comprises a settling tank, crystalliser, filters, and recovered acid store tank. The relatively small space occupied by the plant in comparison with old-fashioned systems is noteworthy. This plant handles 33 tons per week of 120 hrs. of spent acid. The saving in acid on such a plant represents an annual saving of at least £6,000 per annum.

Unfortunately, however, there is no simple system of recovery available for spent hydrochloric acid, and it is essential that neutralisation is practised in this case. One plant in which neutralisation is effected is operated by passing the contents of the liming tank into a special mixing vessel together with the spent acid bath.

Materials of Construction

Many different materials of construction have been employed for the manufacture of pickling tanks, storage tanks, and drafting systems, the commonest being timber, acid brick and tile, lead, rubber, Prodorite and Keebush. Some of these materials, such as timber and acid brick or tile, are not much used in modern plants, and the newer materials by virtue of their better resistance to corrosion and adaptability are generally preferred.

General Conclusions and Observations

The steel and allied industries in this country have been hard-pressed during the war and unable to replace obsolete plant in many instances, as little new equipment has been available. With the changeover from war to peace time production these industries are no doubt reviewing their process plant and equipment with a view to increasing production efficiency and generally improving working conditions. It is to be hoped that the pickling plant, which for so long has been the Cinderella of the production shops in these industries, will be paid the attention and consideration that it merits in relation to the other departments.

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(*Continued at foot of column 2, overleaf.*)

ASSISTANCE TO EXPORT TRADE

By F. J. TEBBUTT

The Export Guarantees Act, 1945, a measure passed by the late Government, designed to assist the export trade of this country, increases the aggregate amount the Board of Trade is empowered to apply in the giving of guarantees to British firms, against the possible default of foreign buyers (*i.e.*, individuals, firms and governments) in the payment for goods, etc., and in other directions, this amount now to be £200 million instead of £75 million as formerly. The limit for goods not home-produced is to be £15 million instead of £7½ million, and for matters which can be said to establish or encourage export trade, up to £5 million (instead of £2½ million) is earmarked (under this head could come fees of experts, fees of consulting engineers, cost of training employees abroad, and so forth). A point to note is that not only goods are covered, but a guarantee can apply to the execution of works or services outside the United Kingdom apart from actual goods, including provision of labour or materials, so such things as the installation of machinery or plant, erection of buildings, and so on, could be covered, and unlike formerly, where the guarantee for these matters was limited to one-third of the price of the goods, there is no limit in this direction. A guarantee can apply to sales by merchants and sales from stocks already abroad. In addition to the above, this new Act allows guarantees to be given U.K. firms for goods, which can be foreign goods, going from one foreign country direct to another country without coming here or indirectly through *entrepôt* rules. Thus, as an example, French goods sent from France direct to United States, or say through the *entrepôt* port of London could come under the new provision. But it should be understood that this provision is primarily intended for the merchanting of unmanufactured goods and other primary products, as manufactured goods are specifically excluded from the provision, unless in the opinion of the Board of Trade guarantees could be given without injury to the export trade of this country. Semi-manufactured goods, however, can come under this provision, that is goods where there is some element of manufacture or treatment, as, for example, such products as copper, wool or rubber.

Policies

The principal policy is now called the Export Credit Guarantee Department (Contracts) Policy, the insurance covering the possibility of the insolvency of the buyer, exchange restrictions operating against the transfer of sterling to Great Britain, war between the buyer's country and this country, or war, rebellion, civil commotion, or other disturbance in the buyer's country, cancellation of an export licence or imposition of restrictions on the export of goods not formerly subject to licence, possible increase in freight or insurance charges, and any other matter outside the control of the exporter or buyer occurring from events outside this country. This cover would return 85 per cent. of the contract price as regards insolvency or protracted default—for all other risks 90 per cent. In addition a sum from the debtor's estate, and so forth, may be received, this being apportioned as to 15 per cent. (or 10 per cent.) to the exporter, the remainder going to the Export Credits Department (that is according to the risk carried by each party in the transaction). This policy covers all the overseas trade of the firm concerned, but it can be confined to certain markets only, the position being that markets can be omitted where the exporter is prepared to take on the risk himself. But in these cases the business submitted must be reasonable and not just one transaction on one market with one shipment; in these cases also the premium would be at a higher rate than where the exporter insures the whole of his export business.

Another policy is the E.C.G.D. (Shipments) Policy (this being at a lower rate of premium than the comprehensive policy mentioned above), under which only shipments are declared, the policy not covering the risk of loss prior to shipment.

IT IS EXPECTED that the second large-capacity blast furnace now in course of erection will be ready for production towards the end of the year, states the annual report of the Consett Iron Company, Limited. Construction work on the new coke ovens and other developments is proceeding satisfactorily.

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(*Continued from previous page.*)

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BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION

ANNUAL GENERAL MEETING

At the 26th annual general meeting of the members of the British Non-ferrous Metals Research Association, held at the Queen's Hotel, Birmingham, on June 17, 1946, Mr. R. Lloyd Gibbins, J.P. (vice-chairman of council) presided in the regretted absence of the chairman of the council, Sir John Greenly.

Mr. Lloyd Gibbins, in discussing the future policy of the Association, referred to the building plans for the reconstruction or adaptation of the Association's premises and to the fact that a very satisfactory arrangement had been made with the Midland Bank, Limited, for a loan to provide the necessary finance for the capital outlay on buildings and equipment. He expressed appreciation on behalf of the council of the Bank's action in granting these facilities. He made reference to the purchase of an electron microscope for the use of the Association and pointed out that it was thought to be a proper course for the Association to investigate to the full possibilities of the use of this tool for the purposes of the industry. In conclusion, Mr. Lloyd Gibbins commended to members the foreword of the report by the chairman of council, Sir John Greenly.

Sir Arthur Smout, in supporting the adoption of the annual report said he considered that the time had come when members should take stock of the position and ask themselves "what do we expect from the Research Association?" and "what are its proper functions in relation to our industry?"

Planning of Technical Development

Stating that he did not wish to be misunderstood Sir Arthur Smout suggested that members of the industry must not place too much reliance on the B.N.F.M.R.A. inasmuch as they must not expect that organisation, excellent though it was, to do all their research work for them and to solve all their domestic day-to-day problems. These were essentially the province of the industry's own research staff, works metallurgists and production investigators located in the factory itself. In these days all members, or nearly all, employed a competent technical staff, men of a calibre equal to those employed by the Research Association, and these must be used to tackle the day-to-day problems which were best handled on the spot and preferably "on the floor of the shop." Thus the Research Association was free to get down to the more fundamental work and particularly to devote adequate time to forward thinking and planning of technical development. In this connection the recent decision of the Association to acquire an electron microscope was, he thought, a major move in the right direction, for the Association could "iron out" many preliminary difficulties and advise members as to whether this highly technical piece of apparatus was of practical value to the industry. In referring to fundamental work being essentially the province of the Research Association, Sir Arthur did not want to infer that this should not be undertaken by members, who had made and he hoped would continue to make most valuable contributions in this field.

Review of Activities

Mr. G. L. Bailey, director, replying at the invitation of the chairman, spoke on the activities of the Association during the past year. He referred to certain important changes which had taken place as a result of the recommendations of the committee for future policy and progress. The work to be carried out by the Association in the future would be more and more connected with long-range problems, but at the same time its ultimate object must not be forgotten and the work must be such as would be likely to lead to industrial development. The industrial research committees and the research board which had been set up provided the machinery for each section of the industry to influence the research programme according to its need and for proper co-ordination of the requirements of the different sections. While he agreed with Sir Arthur that handling of day-to-day problems was most effectively carried out by the works technical staff, it should not be overlooked that the staff of the Association were always available for consultation on such matters. The breadth of the Association's work often enabled its staff to give useful advice on specific problems, even thought they might well know less than the industrial scientist about the production techniques involved. At the same time the Association had a duty to members who might not yet have built up the scientific staff adequate for dealing with all their production difficulties. While, therefore, he agreed wholeheartedly with Sir Arthur's general thesis he would not like it to be thought that the Association's staff were not available for and could not usefully be consulted on immediate industrial problems, although such work was secondary to the Association's long-term research work. If, however, the Association was to carry out the long range work required by the industry it must have the space, the men and the money. The space was becoming available and he had great hopes that the industry would see to it that the necesary finance was also forthcoming.

NEW SPECIFICATION FOR LAMP COLUMNS

The British Standards Institution have just issued a specification for cast-iron street lighting columns—B.S. 1249.

The specification provides for columns for gas and electric lighting suitable for four groups of lighting classes giving a light source at approximately 30, 25, 15 and 13 ft. above ground level. The construction and design of the column is specified and the weight of the column and permissible deflection of the column, together with the method of carrying out the deflection test. The design of this column has been submitted to the Fine Arts Commission and has received their approval.

Copies may be obtained on application from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s.

IMPORTS AND EXPORTS OF IRON AND STEEL

BOARD OF TRADE RETURNS FOR MAY

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in May and in the first five months of 1946. Figures for five-twelfths of 1938 are given for purposes of comparison.

Total Exports of Iron and Steel

Destination.	May, 1946.	Five months ended May.	Five-twelfths of 1938.
	Tons.	Tons.	Tons.
Eire	7,306	31,460	23,216
Channel Islands	777	2,389	3,090
Palestine	13,057	38,523	3,363
British West Africa	4,946	20,405	20,726
Union of South Africa	28,551	103,858	96,286
Northern Rhodesia	210	1,621	8,572
Southern Rhodesia	6,792	28,502	15,088
British East Africa	2,626	10,318	10,805
British India	8,046	36,128	66,116
Burma	1,999	6,478	7,713
British Malaya	1,869	12,013	27,743
Ceylon	926	4,645	10,846
Hong Kong	1,099	6,754	9,831
Australia	4,711	13,955	71,210
New Zealand	5,011	20,461	54,951
Canada	520	2,721	35,587
British West India Islands	2,536	9,139	18,437
Anglo-Egyptian Sudan	3,934	7,486	3,454
Other British Countries	5,035	11,964	9,132
Soviet Union	2	2	1,812
Finland	6,108	18,026	7,336
Norway	11,451	37,032	8,447
Iceland	2,735	5,326	274
Denmark	24,722	96,266	36,356
Poland	6,101	10,595	1,036
Netherlands	13,245	86,330	21,483
Dutch East Indies	—	605	11,378
Dutch West India Islands	343	4,426	1,027
Belgium	4,460	16,471	8,469
France	11,094	39,561	5,578
Portugal	3,535	22,015	3,214
Portuguese East Africa	255	1,931	5,925
Spain	348	4,839	3,235
Italy	21	238	2,141
Greece	563	3,627	730
Turkey	2,065	6,600	5,732
Egypt	11,105	50,481	14,337
Iraq	3,758	27,044	10,725
Iran	5,291	45,598	45,992
China	353	2,876	9,221
U.S.A.	51	315	911
Venezuela	3,032	11,213	1,948
Ecuador	105	1,147	663
Chile	622	2,365	2,622
Brazil	5,276	21,380	7,079
Uruguay	710	3,269	3,161
Argentine	6,373	30,656	33,065
Other Foreign Countries	31,838	98,961	48,214
Total	255,513	1,018,015	798,281

THE MINISTER OF SUPPLY has appointed a committee under the chairmanship of Mr. Justice Evershed to investigate and report on matters connected with the manufacture and supply of textile machinery to the cotton industry recommended for immediate investigation in the report of the Cotton Industry Working Party.

Total Imports of Iron and Steel

From	May, 1946.	Five months ended May.	Five-twelfths of 1938.
	Tons.	Tons.	Tons.
British India	704	9,476	64,846
Australia	15,068	31,398	15
Canada	15,518	64,752	48,905
Other British Countries	62	128	2,232
Sweden	280	1,012	37,415
Norway	49	2,121	14,072
Belgium	24	2,065	114,032
Luxemburg	—	—	24,417
France	—	60	107,226
U.S.A.	18,407	68,039	83,622
Other Foreign Countries	254	439	63,224
Total	50,366	179,490	560,112
Iron ore and concentrates—			
Manganiferous	18,500	25,400	25,951
Other sorts	578,122	2,515,668	2,125,778
Iron and steel, scrap and waste, fit only for the recovery of metal	74,767	211,416	263,418

Exports of Iron and Steel by Products

Product.	May, 1946.	Five months ended May.	Five-twelfths of 1938.
	Tons.	Tons.	Tons.
Pig-iron	886	2,149	39,142
Ferro-alloys, etc.—			
Ferro-tungsten	40	199	215
Spiegeleisen and ferro-manganese	6,336	30,395	2,165
All other descriptions*	69	494	437
Ingots, blooms, billets and slabs	406	957	4,060
Iron bars and rods	1,190	5,917	1,332
Sheet and tinplate bars	—	221	5,158
Wire rods and bright steel bars	7,384	22,305	4,070
Other steel bars and rods	31,414	117,139	42,501
Special steel	2,138	7,129	2,055
Angles, shapes and sections	16,533	67,390	28,085
Castings and forgings	407	1,242	647
Girders, beams, joists and pillars	3,273	39,417	13,946
Hoop and strip	7,469	34,994	15,574
Plates, ¼in. thick and over	38,229	147,230	54,566
Black plates	2,950	10,951	6,057
Black sheets	4,867	13,629	26,463
Galvanised sheets	4,401	9,329	61,222
Tinplates	9,137	42,517	133,044
Tinned sheets	260	1,090	587
Terneplates	46	287	1,802
Decorated tinplates	99	395	1,820
Cast-iron pipes, up to 6 in. dia.	4,762	16,576	20,387
Do., over 6 in. dia.	3,006	12,220	17,901
Wrought-iron tubes	31,830	116,350	91,656
Steel rails	18,778	84,822	44,167
Sleepers and fishplates	12,360	54,593	10,576
Other railway material	3,219	9,335	11,155
Wire	8,686	31,931	22,992
Wire manufactures	3,854	12,573	12,287
Nails, tacks, etc.	744	3,412	1,586
Rivets and washers	707	3,462	3,557
Wood screws	660	2,473	1,047
Bolts, nuts, and metal screws	2,531	9,657	7,322
Stoves, grates, etc.	577	2,473	3,812
Sanitary cisterns	100	375	1,172
Fencing material	243	1,593	2,137
Anchors, etc.	524	2,096	2,640
Chains	858	3,511	2,622
Springs	803	3,121	1,638
Hollow-ware	3,750	27,759	4,459
All other manufactures	19,987	64,307	90,189
Total	255,513	1,018,015	798,281

* The figures for 1946 are not completely comparable with those for earlier years.

NEWS IN BRIEF

HERTS WELDING, LIMITED, is being wound up in members' voluntary liquidation.

THE ADDRESS OF the Leeds Regional Machine Tool Disposal Centre is now 10, Bank Street, Off Boar Lane, Leeds, 1.

NEWMAN INDUSTRIES, LIMITED, electrical and mechanical engineers, Bristol, have received permission to deal in £8,689 8s. ordinary stock.

WASHINGTON TOOL EQUIPMENT COMPANY, LIMITED, is to be wound up voluntarily. Mr. H. Jones, 110, Colmore Row, Birmingham, is the liquidator.

G. HOPKINS & SONS, LIMITED, brewers' engineers, etc., of Highbury, London, N.7, have received permission to deal in shares of 2s. each fully paid.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steel Works, Sheffield, have received a contract totalling £420,000 for two complete cement plants for China.

THE ENGLISH ELECTRIC COMPANY, LIMITED, have received an order for £1,750,000 worth of electrical railway equipment from the New Zealand Government.

STRACHAN & HENSHAW, LIMITED, of Bristol, have received an order from Czechoslovakia for ore-preparation plant weighing about 160 tons and worth some £30,000.

WHITEHOUSE PRECISION TOOL & ENGINEERING COMPANY, LIMITED, is to be wound up voluntarily. Mr. S. R. Hogg is the liquidator. The company is to be reconstructed.

RUSTON & HORNSBY, LIMITED, engineers, boilermakers, etc., of Lincoln, have received Treasury consent to make an issue to shareholders of 410,000 ordinary £1 shares.

A BRITISH STANDARDISED MARKING SYSTEM for grinding wheels has been issued by the Abrasive Industries Association. It covers the nature of the abrasive, grain size, grade and bond.

THERE WILL BE an on-site sale of surplus machine tools by the Ministry of Supply at the Castle Bromwich Works, near Birmingham, of Vickers-Armstrongs, Limited, from July 17-23.

THE LONDON AND HOME COUNTIES AREA of the Association of Bronze and Brass Founders will hold an informal meeting at Brown's Hotel, London, W.1, at 12.45 p.m. on Tuesday next.

C. A. PARSONS & COMPANY, LIMITED, engineers, turbine makers, etc., Newcastle-upon-Tyne, are spending nearly £1,000,000 in modernising their works with the object of doubling production.

TWENTY-FIVE FRENCH INDUSTRIALISTS visiting Britain under the auspices of the Commission Générale d'Organisation Scientifique saw the British Council film "Steel" in the Council's theatre.

THE NATIONAL ARBITRATION TRIBUNAL has decided against the women engineers in their claim for a higher increase than the 4s. 6d. addition to their national bonus offered by the employers on May 3.

MAGNESIUM WORKS, erected at Harrington, Cumberland, by the Ministry of Supply at a cost of £750,000, are to be closed. The works were started during the war and are now stated to be uneconomical.

THE ANNUAL VISITING DAY for members of the British Cast Iron Research Association will take place at Alvechurch on Wednesday next. Each member-firm may send an unrestricted number of representatives.

A. REYROLLE & COMPANY, LIMITED, manufacturing electrical engineers, of Hebburn, who had their inception in a work-room in a house in London with six employees, have recently celebrated their diamond jubilee.

THE PROPOSAL to increase the capital of Ransomes & Rapier, Limited, engineers and ironfounders, of Ipswich, to £600,000 was approved unanimously at a meeting of shareholders. Permission to deal in the new shares has been granted.

MR. GEORGE BUCHANAN, under-secretary for Scotland, recently visited some of the works in the Scottish light-castings industry where heating, cooking, and other domestic fittings are being made for the Government's housing programme.

A POLICY STATEMENT issued unanimously by the Far Eastern Commission from Washington contains a proposal that Japan's maximum annual production should be limited to 3,500,000 metric tons of steel ingots and 2,000,000 metric tons of pig-iron.

UNITED STEEL COMPANIES, LIMITED, have received permission to deal in 1,883,454 4½ per cent. cumulative preference shares of £1 each, fully paid (conversion); and 4½ per cent. cumulative preference shares of £1 each, fully paid (cash) after allotment.

EMPLOYEES AT THE West Hartlepool works of the South Durham Steel & Iron Company, Limited, have joined in the protest already made by the Town Council against the threat to the works contained in the report of the British Iron and Steel Federation.

SIR HARTLEY SHAWCROSS, Attorney-General, speaking last week, said that if those who were considering withdrawing their services from industry would now come back or carry on for a year or 18 months it would go far towards helping us to win the peace.

THE AUTHORISED CAPITAL of J. Brockhouse & Company, Limited, manufacturers of springs and axles, etc., West Bromwich, has been increased to £2,000,000 by the creation of 480,000 4½ per cent. cumulative preference shares of £1 each, and 520,000 shares of £1 each.

FOLLOWING A VISIT to India by Mr. E. R. Howlett, works manager, and Mr. C. J. Ritchie, general sales manager, who travelled over 17,000 miles in that country, Aveling-Barford, Limited, of Grantham, have received a £1,000,000 order for road rollers and equipment.

DETAILS OF THE SALE of the Marconi Wireless Telegraph Company, Limited, to the English Electric Company, Limited, reveal that English Electric is to pay £3,750,000 for the whole share capital of Marconi's, of which the small number of outside shareholders will receive their due proportion.

MR. J. BINNS, M.P., commenting at Gillingham on June 22 on the proposal to transfer the aircraft factories of Short Bros. from Rochester to Belfast, said the Medway towns would benefit because light engineering firms would be introduced. One firm alone proposed to employ 800 men on Diesel engineering, he said.

THE ANNUAL REPORT of Harland & Wolff, Limited, states that the volume of naval shipbuilding and ship-repairing work has diminished since the cessation of hostilities, but a number of important contracts for passenger and cargo liners have been secured. A considerable amount of reconditioning work is also in hand.

FOLLOWING THE RETIREMENT of Mr. Robert Henderson, who has managed their Glasgow office for many years, Peter Brotherhood, Limited, engineers and iron-founders, of Peterborough, have appointed Henderson Agencies (1945), Limited, 26, Bothwell Street, Glasgow, C.2, to be their agents for Scotland and Northern Ireland.

MR. M. A. T. JOHNSON, presiding at the annual meeting of Richard Johnson & Nephew, Limited, said they had embarked on considerable capital expenditure in both their ferrous and non-ferrous departments. The most important individual item was the complete modernisation of their wire-rod mill at a cost of about £250,000.

THE CAPITAL OF C. Lindley & Company, Limited. manufacturers of bolts and nuts, etc., of London, N.1, and Luddenden, Yorks, is to be increased to £70,000 by the creation of 400,000 new ordinary shares of 1s. each. The directors intend to offer 324,650 of the new shares at 3s. to existing holders in the proportion of one for every three held.

ENGINEERS TO PRESS FOR 40-HOUR WEEK

The national committee of the Amalgamated Engineering Union, at its conference at Blackpool last week, decided to press the claim for a 40-hr. week, 12 days' paid holiday, and payment for all bank holidays. The executive was instructed to ask the T.U.C. to consult union executive councils to work out the organisational question for introducing the 40-hr. week as soon as possible. The conference also agreed that an application should be made to have the Factory Acts affecting the hours of workers under 16 extended to include all under 21.

The need for production targets now as in wartime and the full use by the Government of its powers, was stressed by Mr. Jack Tanner, president of the A.E.U., when he addressed the conference. The Government should use its powers to the full to obtain full employment, re-equip industry for export, and produce the goods most essential to consumers, he said.

PERSONAL

MR. RICHARD S. GUINNESS has resigned from the board of Baldwins Holdings, Limited, due to his desire to reduce his activities.

DR. O. SUSSMAN has resigned from the board of Anglo Metal Company, Limited, with effect at June 30. MR. H. K. HOCHSCHILD and MR. C. SUSSMAN have been appointed directors as from July 1.

MR. G. A. MORRIS, manager of the Dunlop sub-contracting department from 1940 to 1945, has been appointed manager of the repairs and service section of the Dunlop Rim & Wheel Company, Limited, Foleshill, Coventry.

MR. PATRICK R. BROGAN, who has had a long experience at the East Hecla Works of Hadfields, Limited, Sheffield, where he has specialised in heavy dredger work, is to join the staff of Paterson Simons, Limited, the company's agents in the Malayan Peninsula.

MR. W. H. TELFER has resigned from the chairmanship, but retains his seat on the board of the Coltness Iron Company, Limited. LT.-COL. J. E. H. HOULDSWORTH has been appointed chairman, and SIR IAN FREDERICK CHENEY BOLTON an additional director.

SIR JAMES LITHGOW has received the honorary degree of Doctor of Law from Glasgow University. He is on the board of many shipbuilding, engineering and iron and steel making companies. Early in 1940 Sir James was appointed Controller of Merchant Shipbuilding and Repairs at the Admiralty.

SIR ARCHIBALD ROWLANDS has been appointed Permanent Secretary of the Ministry of Supply in succession to MR. OLIVER FRANKS, who has been released to take up his appointment as Provost of Queen's College, Oxford. MR. T. R. B. SANDERS has been appointed principal director of Technical Development (Defence) in the Ministry.

DR. W. A. ARCHIBALD has been appointed head of the refractories section of the Chemistry Department of the British Iron and Steel Research Association. He has previously carried out research on steel slag refractories problems at the Royal Technical College, Glasgow. For the past seven years he has been with General Refractories, Limited, Glasgow, as technical manager.

MR. ARNOLD TURNER, who is 74 and still employed as an attendant on the braiding machines at the Helsby Works, Ches., of British Insulated Callender's Cables, Limited, was presented with a wallet of money and the company's token for 60 years' continuous service by Sir Alexander Roger, chairman. During his service with the company Mr. Turner has served under eight works managers.

SIR FREDERICK CHARLES STEWART, on whom Glasgow University has conferred the honorary degree of Doctor of Law, is chairman of Kelvin, Bottomley & Baird, Limited, scientific instrument manufacturers, etc., Glasgow, of the Thermotank Engineering Company, Limited, Thermotank, Limited, and deputy chairman of Brown Bros. & Company, Limited, hydraulic engineers' founders, Edinburgh, and a director of several other companies.

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Thickness	3¾ inches

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COMPANY RESULTS

(Figures for previous year in brackets.)

Harland Engineering—Dividend of 7% (same).

Ruston & Hornsby—Dividend of 12½% (same).

Kendall & Gent (1920)—Interim dividend of 5% (same).

General Cable Manufacturing—Interim dividend of 8% (6%).

Bennis Combustion—Final dividend of 5%, making 10% (same).

Walsall Conduits—Final dividend of 35%, making 55% (same).

Allied Ironfounders—Final dividend of 7½%, making 12½% (same).

Whitehead Iron & Steel—Final dividend of 10%, making 20% (same).

Guest, Keen & Nettlefolds—Final dividend of 7%, making 11% (same).

J. Stone & Company—Final dividend of 15%, making 25% (same).

Gjers, Mills & Company—Final dividend of 10%, making 12½% (same).

Swan, Hunter, & Wigham Richardson—Interim dividend of 4% (same).

Masson, Scott & Company—Dividend of 5% (same) and bonus of 1¼% (nil).

A.B.C. Coupler & Engineering—Dividend of 15% (same) and bonus of 2½% (nil).

Mason & Barry—Profit for 1945, £22,938; dividend of 10%; forward, £19,237 (£16,817).

Thomas Bolton & Sons—Final dividend of 5% (same), making 7½% (same). No bonus (2½%).

Newman & Watson—Dividend at the rate of 6% per annum for half-year ended March 31 on preference shares.

Mason & Burns—Profit for the year ended March 31, £4,211 (£273); dividend of 5% (same); forward, £10,745 (£7,922).

Twyfords—Net profit for the year ended March 31, £43,127 (£32,734); dividend of 10% (8%); forward, £32,053 (£31,664).

Inbucon—Net profit for the year ended March 31, £26,953 (£24,072); final dividend of 6%, making 8% (same); forward, £1,338 (£1,285).

Scottish Machine Tool Corporation—Net profit for the year ended March 31, £22,174 (£17,396); final dividend of 5%, making 8% (same).

Consett Iron Company—Net profit for the year ended March 31, £481,993 (£364,494); dividend of 10% (same); forward, £255,477 (£212,754).

Scottish Stamping & Engineering—Profit for 1945, after depreciation, income tax, etc., £23,433 (£17,101); dividend of 10% (same); forward, £4,284 (£2,709).

British Thermostat—Net profit for the year ended January 31, £19,782 (£22,611); final dividend of 11%, making 18½% (same); forward, £21,651 (£21,569).

Mellor Bromley & Company—Profit for the year ended February 28, £16,189 (£13,872); final dividend of 5%, making 10% (same); forward, £46,102 (£43,980).

F. H. Lloyd & Company—Profit, £63,768 (£66,970); to general reserve, £15,000 (£22,854); final dividend of 7%, making 10% (same); forward, £11,044 (£9,087).

Milners Safe Company—Net profit for the year ended March 31, £11,750 (£16,357); dividend of 7½% (same) and bonus of 2½% (same); forward, £12,761 (£9,261).

Whessoe—Net profit for the year ended March 31, £164,581 (£186,836); final dividend of 30%, making 40% (same) and bonus of 10% (nil); forward, £39,195 (£41,443).

Ward & Goldstone—Net profit for the year ended March 31, £54,081 (£38,939); final dividend of 20% (10%), making 35% (20%); no bonus (5%); forward, £84,365 (£55,542).

Scaffolding (Great Britain)—Net profit for the year ended September 30, £55,619 (£78,246); dividend of 10% (same) and bonus of 10% (same); forward, £16,783 (£17,468).

Tredegar Iron & Coal Company—Net profit for the year ended March 31, £143,238 (£101,283); dividend on the "A" and "B" shares of 9% (7½%); forward, £101,472 (£43,923).

Hattersley (Ormskirk)—Net profit for the year ended March 31, £47,226 (£41,518); final dividend of 11½% (same) and bonus of 2½% (nil), making 20% (17½%); forward, £14,944 (£14,468).

Fullers' Earth Union—Net profit for the year ended March 31, after depreciation, taxation, etc., £22,706 (£22,793); dividend of 11% (same) and bonus of 2½% (nil), making 17½% (15%); forward, £7,545 (£4,897).

Butterley Company—Net profit for the year ended March 31, £188,208 (£125,317); dividend of 8½%, making 12% (same), and a bonus of 2½% (nil); to reserve, £25,000 (£46,350); forward, £71,578 (£70,020).

Rheostatic Company—Profit for the year ended September 30, 1945, after providing for depreciation, etc., £9,425 (£9,730); to general reserve, £2,000 (£4,000); final dividend of 8%, making 12%; forward, £4,999 (£4,170).

CONTRACTS OPEN

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Stockport, July 8—20-in. cast-iron pipes and specials, for the Town Council. Mr. T. Reynolds, engineer and manager, Portwood Gasworks, Stockport.

Horsham, July 15—Supply and erection of 364 yds. of wrought-iron railings, for the Urban District Council. Mr. A. Slyfield, clerk, Council Offices, Horsham Park, Horsham.

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WITH OR WITHOUT TRIPOD

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HAND RAMMED MOULDING MACHINE

Raw Material Markets

IRON AND STEEL

The Control of Iron and Steel (No. 50) Order, which came into operation on Monday, increases the price of Staffordshire low-phosphorus pig-iron by 15s. per ton. In addition, the Order increases the maximum prices for certain forms of alloy steel, certain sizes of tube steel billets, galvanised sheets, terneplate and black plate, certain forms of wire and wire rope, etc., steel castings, railway laminated and coil springs, certain tubes and fittings, and certain iron castings.

Pressure for light castings—largely for building requirements—is intense, and the trade needs additional labour if it is to keep pace with its commitments. The foundries are getting all the high-phosphorus pig-iron they need, but there is none to spare, and present supplies do not allow for the accumulation of stocks. Hematite, refined and low- and medium-phosphorus pig-iron, are in steady request by the general engineering and jobbing foundries. Supplies are equal to current needs, but the demand may be expected to expand considerably in the near future.

The scrap metal position is not too happy, and many of the light foundries are badly in need of light and medium cast-iron scrap. Limestone and ganister are presenting no difficulty, and cupola firebricks can be obtained within reasonable periods. Prospects of laying down stocks of foundry coke are not at all bright, and a scheme of rationing is being arranged to cover foundries in all parts of the country.

Sheet makers are heavily committed over a long period. Re-rollers' demands for sheet bars, billets, blooms, etc., are substantial, as also is the call from the wire mills and forges. Deliveries are at a good level, but are insufficient to cover all requirements.

The steelworks have large orders for joists, sections and plates, which will keep them extremely active for months ahead. The call for plates in all thicknesses is particularly heavy. All sizes of structural steel are in good request.

NON-FERROUS METALS

In order to bring the selling prices of copper, lead and zinc in the United Kingdom more closely into line with current purchase costs, the Minister of Supply has made the Control of Non-ferrous Metals (No. 24) Order, 1946, which increases the maximum prices at which these metals may be sold in the United Kingdom. Under the new Order, which came into effect on Monday, the maximum prices for copper, lead, zinc and zinc products are increased as follows:—Copper, by £12 per ton; copper rods, by £12 10s.; lead, by £10; zinc, by £10; zinc sheets, by £10; and zinc oxide, by £8 10s.

Holders of valid licences to purchase copper, lead or zinc metal (as sold by the Directorate of Non-ferrous Metals), granted on or before June 29, may, on application to the Directorate at 20, Albert Street, Rugby, cover themselves by purchases, where they have not already done so, against such licences up to and including July 15, at the maximum prices ruling on June 29.

The Government's lead-buying policy was the subject of a number of questions in the House of Commons on Monday. Mr. Marples asked the Minister of Supply whether he was aware that stocks of refined lead had dropped from 65,300 tons in December, 1945, to 44,600 tons in March, 1946, and what further steps he was taking to improve the situation. Mr. Wilmot replied that in the present acute world shortage of lead it was necessary to run down stocks. A comprehensive rationing scheme was in force and every effort was being made to obtain for this country its full share of the available supplies of lead. In the meantime the maximum use must be made of substitute materials. Lord Hinchingbrooke asked who decided what was our fair share. "Is there some international authority?" he queried. The Minister said they were buying lead in association with the Americans, and they were satisfied that by co-operation they got the best supplies possible. Capt. Crookshank asked what method was adopted to obtain our fair share, to which Mr. Wilmot replied that we were buying lead in the ordinary way and so were the Americans, and we were working with them in securing a reasonable supply of lead available. "We are satisfied that to abandon this practice and go into competitive buying would not improve our position," he added.

Warning of a probable worsening of the lead and tin shortage was given by Prof. W. R. Jones at the Royal Society's Empire Scientific Conference last week. No spectacular discoveries of large ore deposits were being made to-day, he said, and those that had hitherto supplied the bulk of the Empire's requirements were nearing exhaustion. Ninety per cent. of the Empire's production of tin was from surface deposits, which were fast being worked out.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"PARAMAX"—Metals. PARAMOUNT ALLOYS, LIMITED, 47-48, Piccadilly, London, W.1.

"LITHCOTE"—Tanks, pipes, tubes, etc. NEWTON CHAMBERS & COMPANY, LIMITED, Thorncliffe Ironworks, near Sheffield.

"MORLISS"—Fencing and gates. BAYLISS, JONES & BAYLISS, LIMITED, Victoria Works, Cable Street, Wolverhampton.

"KEETONA"—Machinery and hand tools, wholly or principally of metal. KEETON, SONS & COMPANY, LIMITED, Royds Foundry and Engineering Works, Royds Lane, Sheffield, 4.

"KRISTON," "KRISTITE," "DENTESS," AND "VARISEC"—Agricultural and horticultural machinery and implements. RANSOMES, SIMS & JEFFERIES, LIMITED, Orwell Works, John Street, Ipswich.

FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

The FOUNDRY TRADE JOURNAL is the Official Organ of the following :—

THE INSTITUTE OF BRITISH FOUNDRYMEN

PRESIDENT, 1946-47 : **D. Howard Wood**, Constructional Engineering Co., Ltd., Titan Works, Charles Henry Street, Birmingham, 12. *Secretary* : **T. Makemson, M.B.E.** Saint John Street Chambers, Deansgate, Manchester, 3. Phone' and 'Grams : Blackfriars 6178.

BRANCHES :

Birmingham, Coventry and West Midlands : A. A. Timmins, F.R.I.C., A.I.M., 33, Carters Lane, Quinton. *Bristol and West of England* : A. Hares, 648, Stapleton Road, Bristol, 5. *E. Midlands* : S. A. Horton, "Three," Mostyn Avenue, Littleover, Derby. *Lancs* : H. Buckley, Ellesmere, Norfolk Avenue, Burnley. *London* : F. Arnold Wilson, Wm. Jacks & Co., Ltd., Winchester House, Old Broad Street, London, E.C.2. *Middlesbrough* : F. Shepherd, Head, Wrightson & Co., Ltd., Teesdale Iron Works, Thornaby-on-Tees. *Newcastle-upon-Tyne* : C. Lashly, M.C., Sir W. G. Armstrong, Whitworth & Co., (Ironfounders), Ltd., Close Works, Gateshead. *Scottish* : J. Bell, 60, St. Enoch Square, Glasgow. *Sheffield* : T. R. Walker, M.A., English Steel Corporation, Ltd., Sheffield. *Wales and Monmouth* : A. S. Wall, 14, Palace Avenue, Llandaff, Cardiff. *West Riding of Yorkshire* : G. H. Pollard, 1, Tudor Street, Manchester Road, Bradford. *South Africa* : Secretaries, S.A.F.E.M.A., Barclays Bank Buildings, Cr. Commissioner and Harrison Streets, Johannesburg.

SECTIONS :

Burnley : H. Buckley, Ellesmere, Norfolk Avenue, Burnley, Lancs. *Cape Town* : R. W. Lyall, 2, Devonshire Court, Fish-Hoek, Cape Province. *East Anglian* : A. N. Sumner, 516, Norwich Road, Ipswich. *Falkirk* : T. R. Goodwin, "Viewfield," Falkirk Road, Bonnybridge. *Lincoln* : E. R. Walter, Ph.D., The Technical College, Lincoln. *Slough* : E. Raybould. High Duty Alloys, Limited, Slough, Bucks.

BRITISH STEEL FOUNDERS' ASSOCIATION

Chairman : **Charles S. Gill, Davy & United Roll Foundry, Limited,** Empire Works, Haverton Hill, Billingham, Co. Durham. *Secretaries* : **Peat, Marwick, Mitchell & Company,** 301, Glossop Road, Sheffield, 10. 'Phone and 'Grams : Broomhill 63031.

ASSOCIATION OF BRONZE AND BRASS FOUNDERS

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COUNCIL OF IRONFOUNDRY ASSOCIATIONS.

Chairman : **FitzHerbert Wright,** c/o Aveling-Barford, Limited Invicta Works, Grantham. *Secretary* : **T. E. Parkinson,** Derbyshire House Belgrove Street, King's Cross, London, W.C.1. 'Phone: Terminus 7218.

Participating Associations : British Cast Iron Research Association (affiliated) ; Institute of British Foundrymen (affiliated) ; and the following.

Automobile Ironfounders' Association.—Secretaries : Heathcote and Coleman, 25, Bennetts Hill, Birmingham, 2. 'Phone : Midland 2901; 'Grams : "Clarify," Birmingham.

British Ironfounders' Association, and British Bath Manufacturers' Association. Director and Secretary : J. Galbraith Sneddon, C.A., 145, St. Vincent Street, Glasgow, C.2. 'Phone : Central 2891 ; 'Grams : "Groundwork," Glasgow.

British Grit Association.—Secretary : J. Campbell MacGregor, 10, Bank Street, Airdrie, Lanarkshire.

British Malleable Tube Fittings Association.—Secretary : F. B. Ridgwell, 196, Shaftesbury Avenue, London, W.C.2. 'Phone : Temple Bar 3261 ; 'Grams : "Brimatufia Westcent," London.

Cast Iron Chair Association.—Secretary ; G. D. Cunningham, The Andirston Foundry Co., Ltd., Port Clarence, Middlesbrough. 'Phone : Middlesbrough 57255 ; 'Grams : "Afco," Middlesbrough.

Cast Iron Axlebox Association and National Ingot Mould Association.—Secretaries : Peat, Marwick, Mitchell & Company, 301, Glossop Road, Sheffield. 'Phone and 'Grams : Broomhill 63031.

Cast Iron, Heating, Boiler and Radiator Manufacturers' Association.—Secretary : Stanley Henderson, 69, Cannon Street, London, E.C.4 'Phone : City 4444.

Cast Iron Pipe Association.—Secretary : T. Clark, Derbyshire House, Belgrove Street, Kings Cross, London, W.C.1. 'Phone: Terminus 7218.

Cast Iron Segment Association.—Secretary : H.A.D. Acland, 5, Victoria Street, London, S.W.1. 'Phone Abbey 3194.

Flushing Cistern Makers' Association.—Secretary : G. H. Taylor, 267/8, Castle Street, Dudley, Worcs. 'Phone Dudley 3185.

Greensand Pipe Founders' Association.—Secretaries : McClure Naismith Brodie & Company, 77, St. Vincent Street, Glasgow, C.2. 'Phone : Central 9476 ; 'Grams : "Lycidas," Glasgow.

National Association of Malleable Ironfounders.—Secretary : Miss L. Verity, Chamber of Commerce Offices, Tudor House, Bridge Street, Walsall. 'Phone Walsall 5671.

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Leicester and District Ironfounders' Employers' Association.—Secretary : C. S. Bishop, 8, New Street, Leicester. 'Phone : Leicester 58842.

Liverpool and District Ironfounders' Association.—Secretary: J. S. Hassal, 15, Victoria Street, Liverpool. 'Phone : Central 0114.

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Midland Ironfounders' Association.—Secretary : R. Forbes Baird, 117, Church Lane, Handsworth Wood, Birmingham, 20. 'Phone : Midland 3678 ; 'Grams : "Jacelace," Birmingham.

Monmouthshire Founders' Association.—Secretary : E. Kenneth Gould, Tredegar Foundry, Newport, Mon. 'Phone : Newport 4275 ; 'Grams : "Rogerwinch," Newport.

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West of England Ironfounders' Association.—Secretary : R. Forbes Baird, 117, Church Lane, Handsworth Wood, Birmingham, 20. 'Phone : Midland 3678 ; 'Grams : "Jacelace," Birmingham.

West Riding Ironfounders' Association.—Secretary : C. D. Buckle, 13, Cheapside, Bradford. 'Phone : Bradford 5346.

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Alvechurch, Birmingham. 'Phone and 'Grams : Redditch 716.
Scottish Laboratories :— Foundry Technical Institute, Meek's Road, Falkirk. ('Phone : 331.)

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